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Original Contribution

Peripheral nerve blocks with sedation using propofol and alfentanil target-controlled infusion for hip fracture surgery: a review of 6 years in use☆,☆☆

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Abstract

Background and objectives: Over the last 6 years, our center has introduced a novel technique combining peripheral nerve blocks (femoral and lateral femoral cutaneous nerves) with sedation using propofol with alfentanil target-controlled infusion for hip fracture surgery. The purpose of this review was to identify if adverse outcomes (of mortality and length of stay) were associated with its introduction compared to spinal or general anesthesia.

Methods: Retrospective data collection from hospital fracture database. Data were analyzed using Cox regression (adjusted for age, sex, and American Society of Anesthesiologists grade) to compare survival and length of stay data across the different anesthetic techniques used for hip fracture surgery.

Results: This technique was used in 472 (20%) of 2360 hip fractures. There was no significant difference between peripheral nerve blocks with propofol/alfentanil sedation/analgesia for mortality up to 120 days (hazard ratio, 0.76; 95% confidence interval, 0.54-1.06; $P = .11$) and length of stay (hazard ratio, 1.03; 95% confidence interval, 0.91-1.17; $P = .63$) when compared to the other anesthetic techniques of spinal and general anesthesia.

Conclusion: This novel technique does not appear to be associated with adverse mortality or length of stay after hip fracture surgery.

☆ This is an original manuscript. The contents of this submission have not been published elsewhere, and the paper is not being submitted elsewhere. This manuscript has been read and approved by all coauthors.

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1. Introduction

There were >61,500 hip fractures registered in the national hip fracture database in the UK for 2012-2013 period [1]. The UK annual cost of hip fractures (including medical and social care) is estimated to be around 2 billion pounds per year [2]. Postoperatively, patients experience a high morbidity rate approaching 20% (eg, cardiac and pulmonary complications) [3]. Average mortality rate during hospitalization is 5% with a 8% mortality at 30 days and approximately 30% at 1 year [1,4].

Provision of anesthesia for hip fracture is challenging due a lack of large multicentered randomized controlled trials to provide evidence demonstrating a clear benefit of one particular anesthetic technique [5]. An observational study of >65,500 patient record sets in the UK showed that 45% of hip fracture patients received general anesthesia (GA) and 35% received spinal anesthesia with no difference in cumulative 5-day or 30-day mortality even when adjusted for age and American Society of Anesthesiologists (ASA) [6]. Peripheral nerve blocks (PNBs) used as an adjunct to either spinal anesthesia or GA have been recommended to control acute and perioperative pain and to reduce the use of perioperative narcotics [2,7]. In 2007, our institution first introduced femoral and lateral femoral cutaneous nerve blocks combined with sedation using propofol/alfentanil target-controlled infusion (TCIS-PNB) as an alternative to spinal anesthesia (eg, for patients on dual antiplatelet or anticoagulant therapy).

Our primary outcome was to assess if there was any apparent patient harm being caused by the introduction of TCIS-PNB technique compared to other anesthetic techniques (GA alone, spinal anesthesia, or GA-PNB). This was done by using surrogate patient outcome markers of length of stay (LOS) and mortality adjusted for the confounding factors of patient age, sex, and ASA status. Our hypothesis was that the use of TCIS-PNB technique would not be associated with increase LOS or mortality rates in the hip fracture population.

2. Methods

2.1. Description of technique

In our center, when a patient attends the emergency department with a fracture neck of femur, they are offered a fascia iliaca (single shot) block for analgesia. They are then commenced with regular intravenous acetaminophen (1 g q 6 hourly) with oxycodone (2.5-5 mg q 4 hourly PRN) for breakthrough pain. They are seen by orthopedic and orthogeriatric teams, optimized, and scheduled for surgery according to injury type.

On arrival to the operating room (OR), monitors to measure estimated arterial oxygen saturation (SpO2), electrocardiogram and non-invasive blood pressure (NIBP) are applied to the patient. Oxygen is given via a Hudson mask at 2 L/min with a capnography monitoring device tip placed within the mask to monitor respiratory rate. The patient will have intravenous access secured with an 18G cannula. One liter of intravenous compound sodium lactate solution is commenced via 1 port of a Vygon Octopus cannula-care connector. One milligram of alfentanil is added to a 50-mL syringe of propofol (Diprivan) 1%, and it is seated in an Alaris PK syringe pump with the patent's age, sex, and weight programmed in. The estimated target serum concentration (for propofol) is initially set to 1 μg/mL. The infusion is connected to the other port of the cannula connector. A target Ramsay sedation scale of 4 (brisk response to loud auditory stimulus or glabella tap) is achieved by adjusting the target-controlled infusion between 0.5 and 2 μg/mL as determined by clinical parameters and patient responsiveness. Bispectral index measurement is used at the anesthetist's discretion with the sedation target set to between 70 and 80.

Once sedation has been commenced, ultrasound-guided PNB are placed using a Stimuplex A 100-mm needle and a high-frequency linear probe with a Sonosite M-mode Turbo machine. For the femoral nerve block, the needle is advanced in plane in a lateral to medial direction to pierce through fascia lata and fascia iliaca. Once the needle tip is positioned posterior to the nerve 15 to 20 mL of L-bupivacaine 0.5% is injected. The needle may be repositioned to ensure circumferential spread of local anesthetic around the femoral nerve. For the lateral femoral cutaneous nerve (LFCN), the anterior superior iliac spine is located, and the linear probe is placed transversely just inferior to this. The sartorious muscle is identified on ultrasound, and 5 mL of L-bupivacaine 0.5% is injected lateral to this around the LFCN within the lacuna musculorum at this level. For patients weighing <50 kg, injectate volume is reduced to avoid exceeding the maximum recommended dose of 2 mg/kg. The time for establishing sedation, positioning the patient, and performing the block procedure is usually between 10 and 15 minutes. After 20 minutes, the block is tested by confirming anterolateral thigh sensory loss to pinprick and absence of knee flexion. If there is incomplete block of either femoral nerve (FN) or LFCN, the block is repeated in the same fashion. Extra care is taken to avoid exceeding the recommended maximum dose of L-bupivacaine or by causing nerve trauma by a repeated attempt. Once PNB is successfully established, the sedated patient is transferred into the OR. The surgical technique for both dynamic hip screw and hemiarthroplasty procedures is via the anterolateral (Watson-Jones) approach. If PNB is inadequate for surgical anesthesia even after the second attempt, the sedation is discontinued, and a GA is commenced using an intravenous induction agent, followed by endotracheal intubation with positive pressure ventilation. Anesthesia is usually maintained using sevoflurane in air/oxygen mix with intravenous morphine titrated for analgesia.

Postoperatively, the patient is treated with regular intravenous paracetamol, regular modified release oxycodone